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(54) **DECOLORIZING APPARATUS AND METHOD OF CONTROLLING HEAT SOURCE UNITS**

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B41M 7/00 (2006.01)
B41M 5/30 (2006.01)

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CPC **G03G 15/6585** (2013.01); **B41M 7/0009**
(2013.01); **G03G 21/00** (2013.01); **B41J**
2202/37 (2013.01); **B41M 5/305** (2013.01)

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CPC B41J 2202/37; B41J 2/38; G03G 9/0926;
G03G 15/6585

See application file for complete search history.

ABSTRACT

A decolorizing apparatus includes first and second heating units, first and second heat source units, and a controller. The first and second heating units decolorize an image using decolorable colorants which are decolorized if heated. The first heating unit heats one surface of a sheet. The second heating unit heats a remaining surface which is opposite to the one surface of the sheet heated by the first heating unit. The first heat source unit heats the first heating unit. The second heat source unit heats the second heating unit. The controller includes a first mode and a second mode. In the first mode, the controller performs a decolorizing process on both the surfaces of the sheet by heating the first and second heating units using the first and second heat source units. In the second mode, the controller performs the decolorizing process on one surface of the sheet by heating the first heating unit using the first heat source unit, and heats the second heating unit using the second heat source unit with output which is lower than output acquired in the first mode.

8 Claims, 9 Drawing Sheets

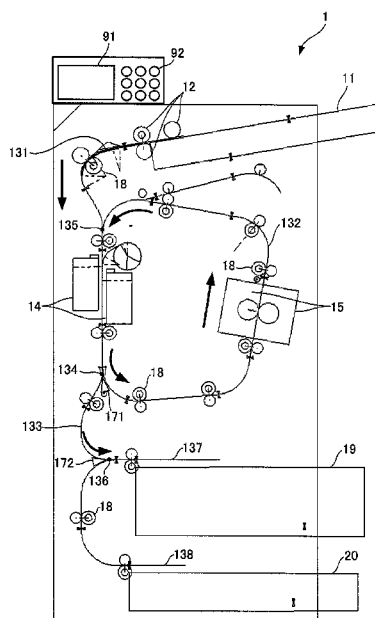


FIG. 1

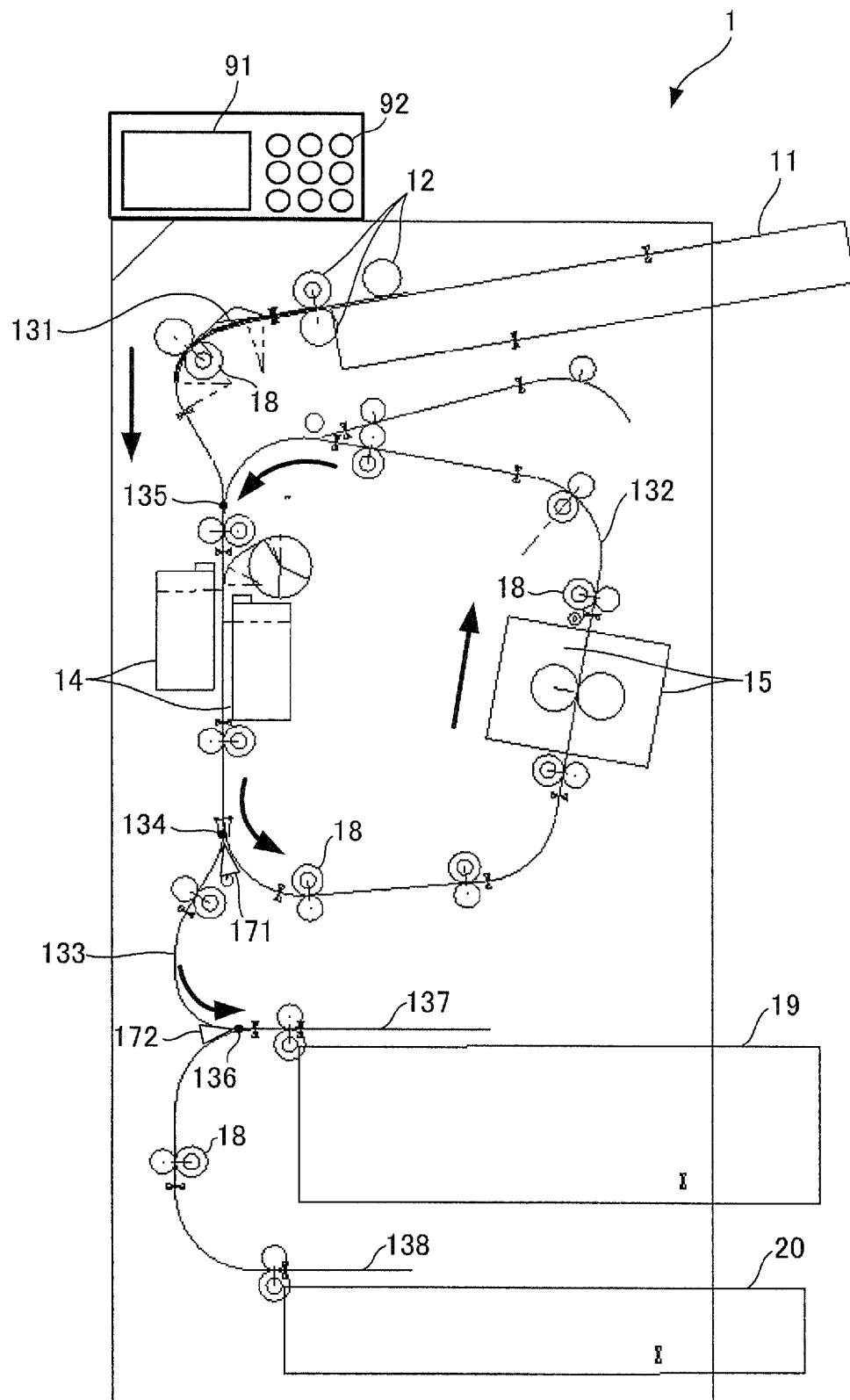


FIG. 2

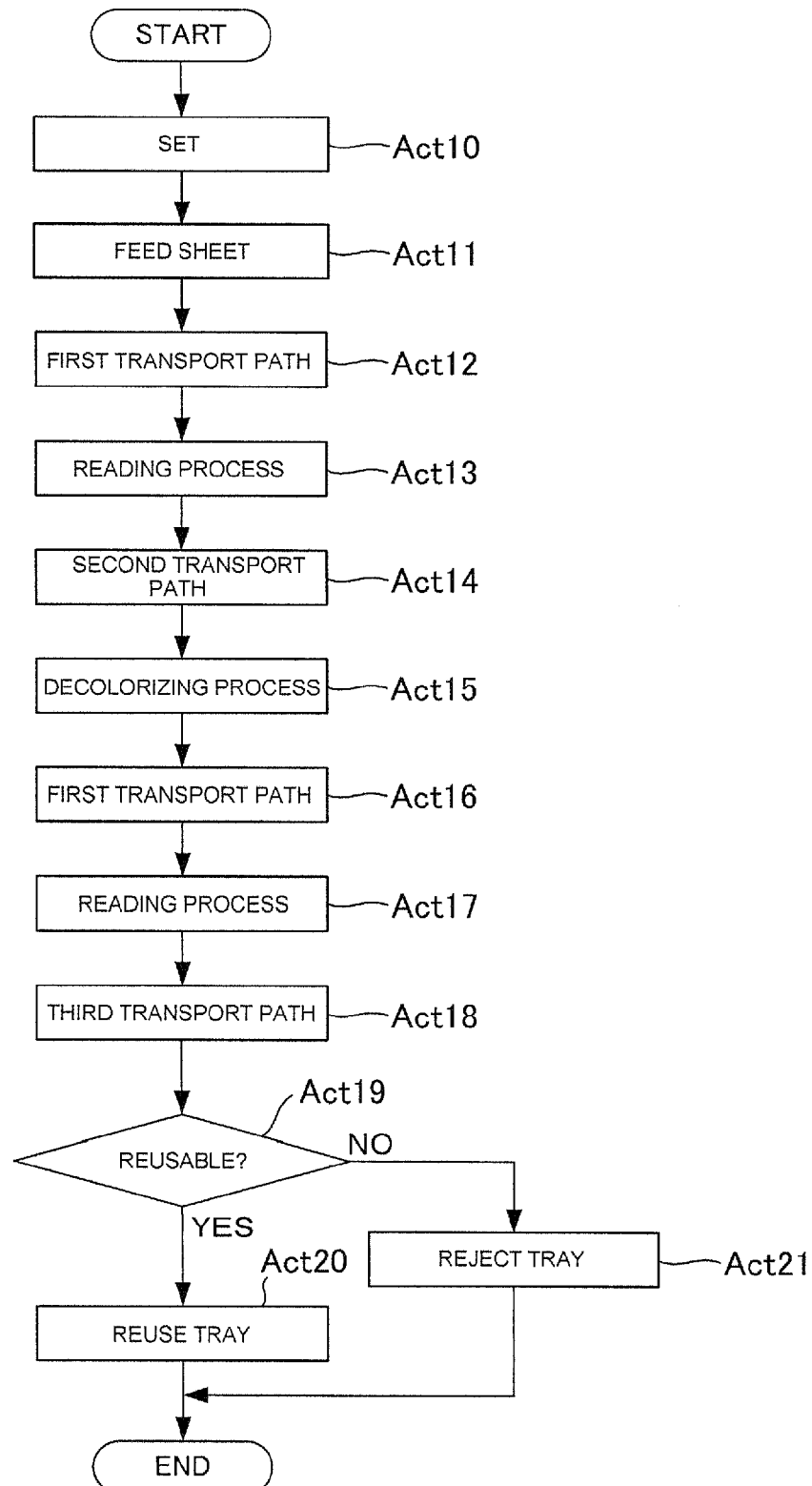


FIG. 3

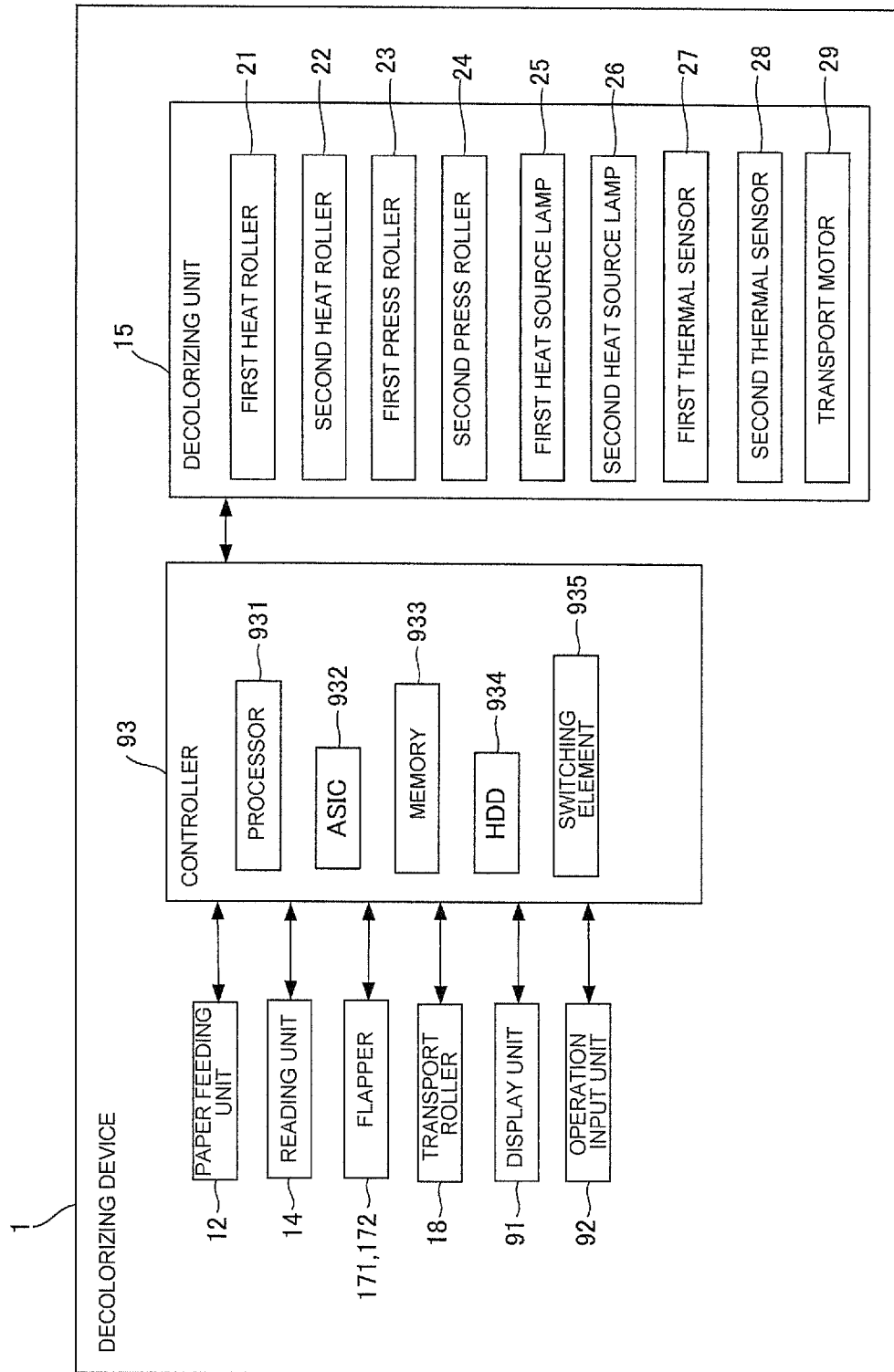


FIG. 4

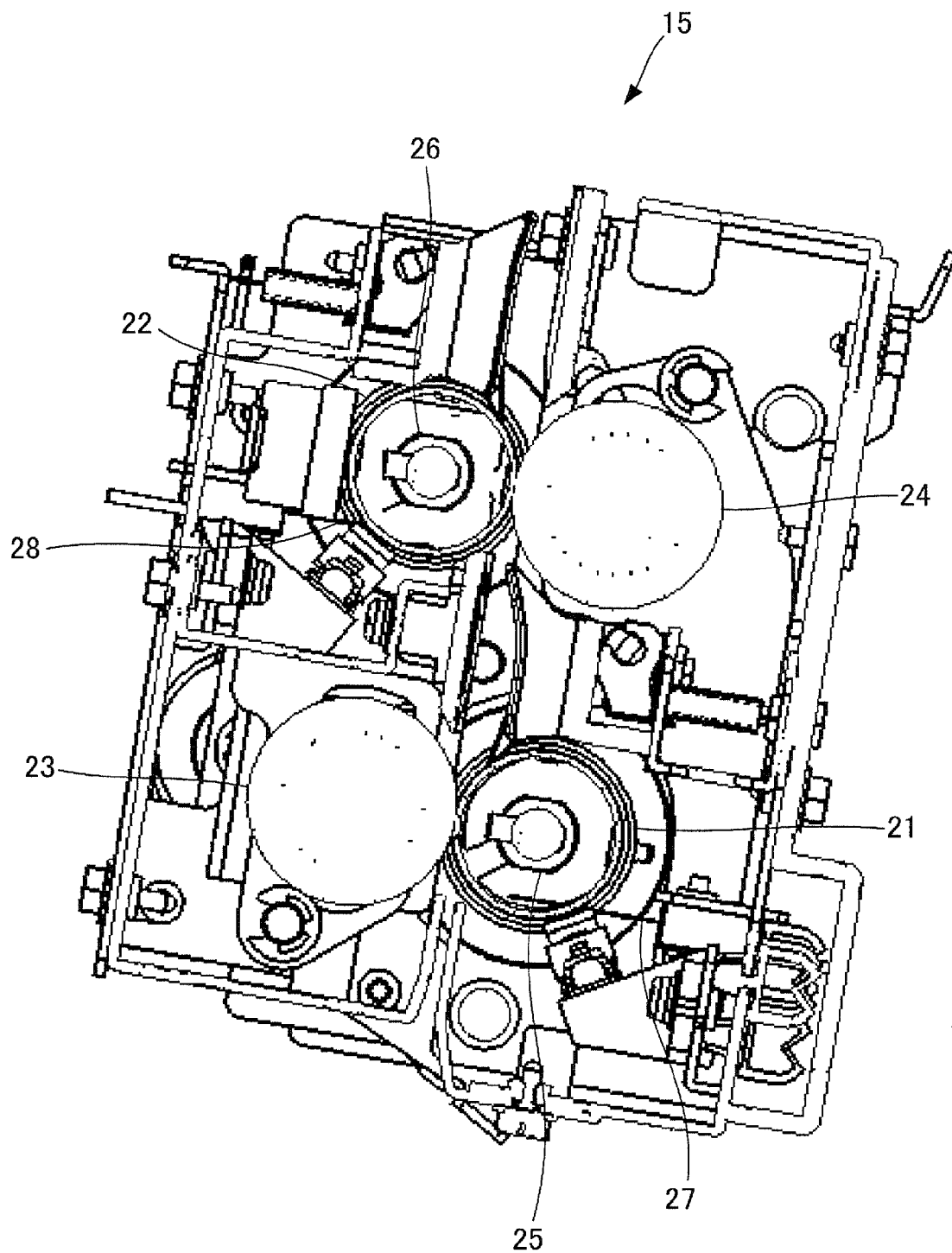


FIG. 5

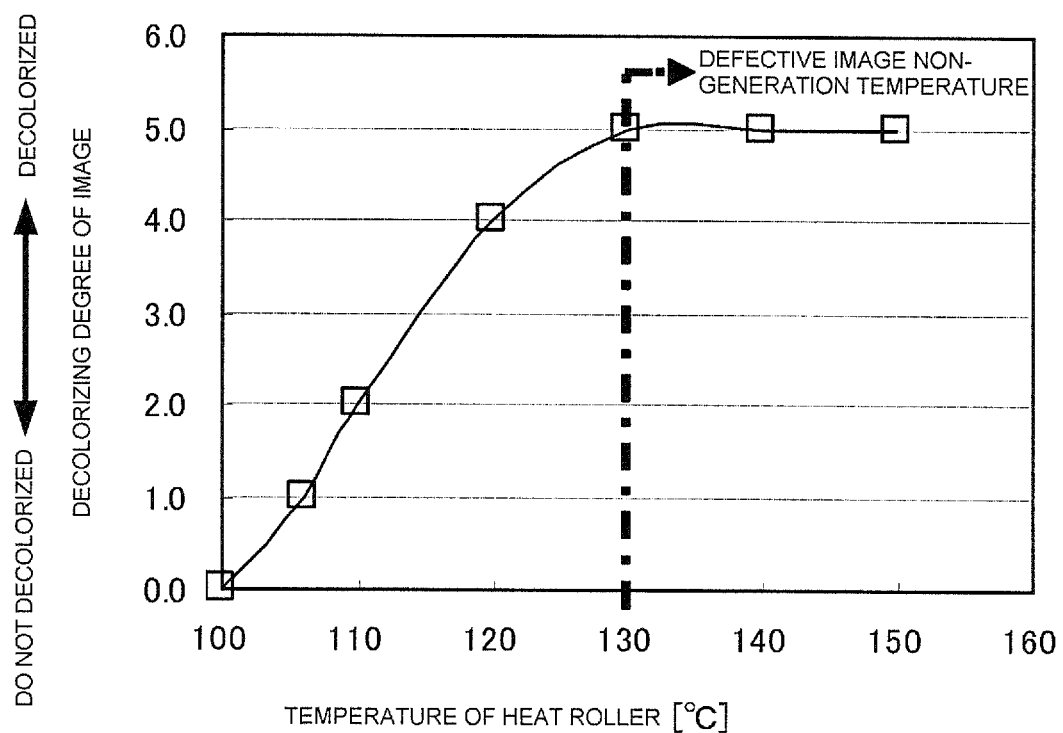


FIG. 6

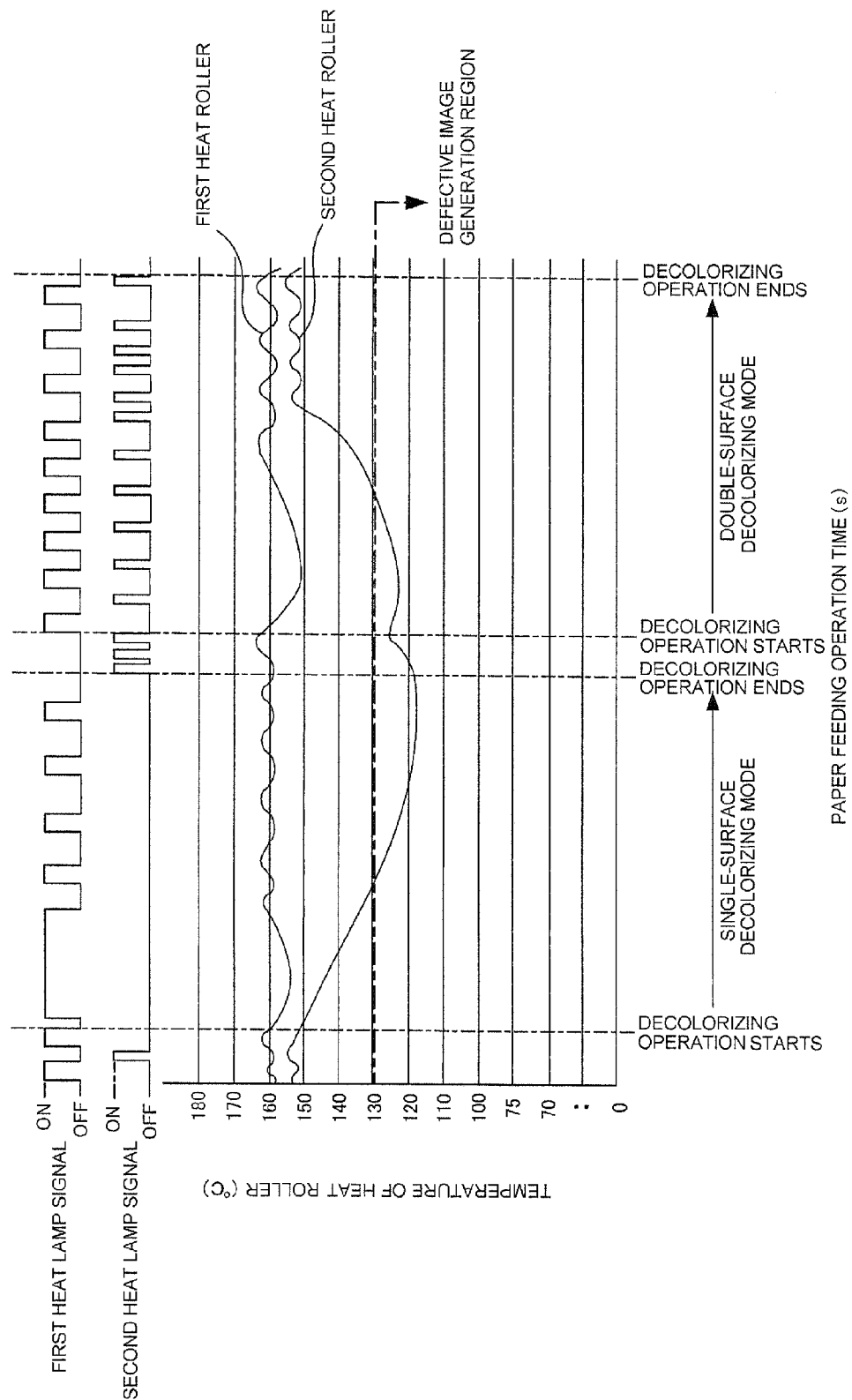


FIG. 7

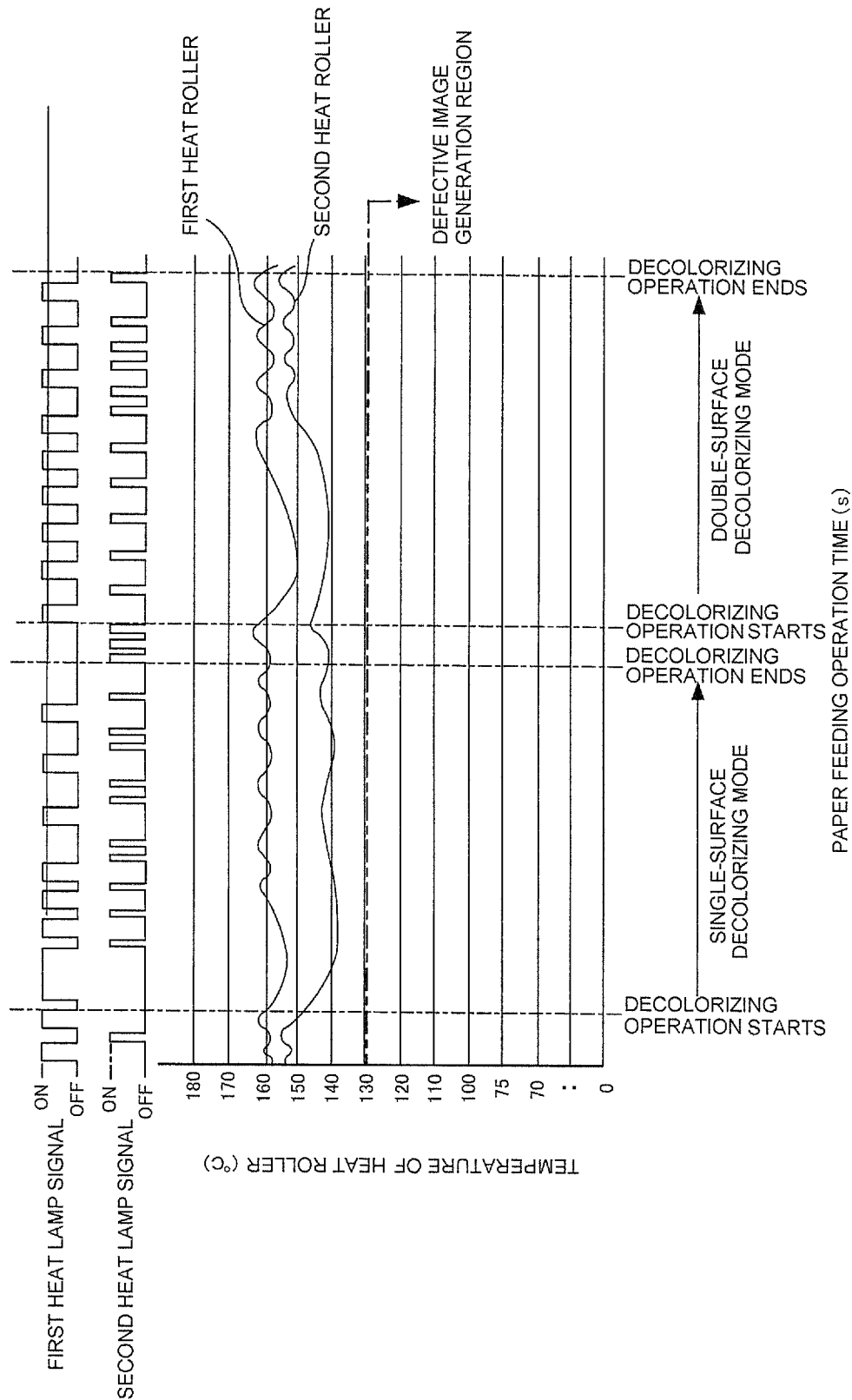


FIG. 8

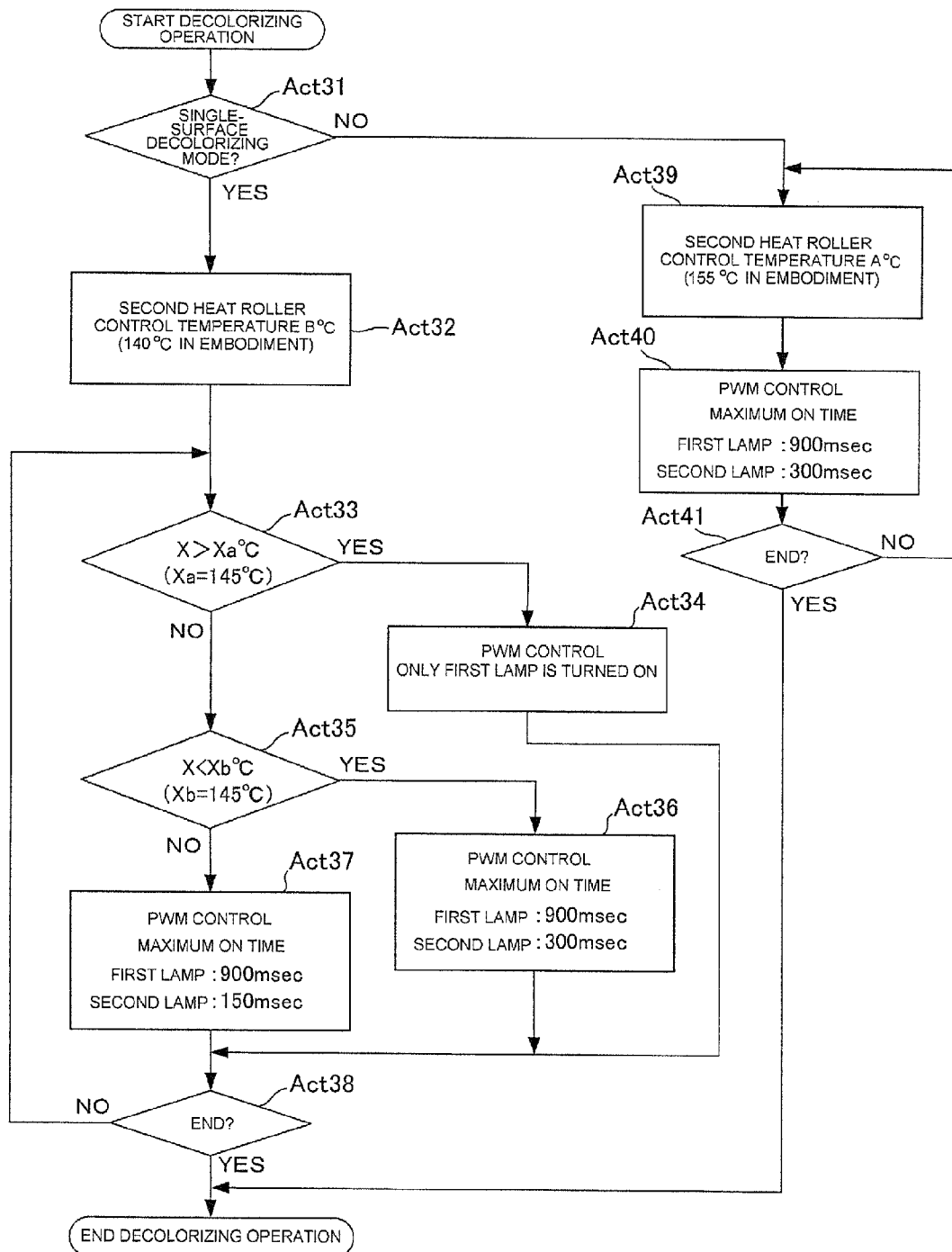


FIG. 9

MODE	SECOND HEATING ROLLER		LAMP LIGHTING AMOUNT (MAXIMUM LAMP LIGHTING TIME)		FIRST HEATING ROLLER
	DETECTION TEMPERATURE	CONTROL TEMPERATURE	FIRST HEATING LAMP	SECOND HEATING LAMP	
SINGLE-SURFACE DECOLORIZING	DETECTION TEMPERATURE $X \geq X_a^{\circ}\text{C}$ (EMBODIMENT: 145°C OR HIGHER)	REFERENCE TEMPERATURE B°C (EMBODIMENT: 140°C)	100% (CONTROL ONLY FIRST LAMP)	0% (CONTROL OF SECOND LAMP IS OFF)	REFERENCE TEMPERATURE C°C (EMBODIMENT: 160°C)
	DETECTION TEMPERATURE $X_a > X \geq X_b^{\circ}\text{C}$ (EMBODIMENT: 130°C OR HIGHER AND 145°C OR LOWER)	REFERENCE TEMPERATURE B°C (EMBODIMENT: 140°C)	85% (EMBODIMENT: 900 msec)	15% (EMBODIMENT: 150 msec)	↑
	DETECTION TEMPERATURE $X < X_b^{\circ}\text{C}$ (EMBODIMENT: 130°C OR LOWER)	REFERENCE TEMPERATURE B°C (EMBODIMENT: 140°C)	75% (EMBODIMENT: 900 msec)	25% (EMBODIMENT: 300 msec)	↑
DOUBLE-SURFACE DECOLORIZING	—	REFERENCE TEMPERATURE A°C (EMBODIMENT: 155°C)	75% (EMBODIMENT: 900 msec)	25% (EMBODIMENT: 300 msec)	↑

1

DECOLORIZING APPARATUS AND METHOD OF CONTROLLING HEAT SOURCE UNITS

FIELD

Embodiments described herein relate generally to a technology for controlling heat source units of a decolorizing apparatus.

BACKGROUND

In recent years, images are formed on a sheet using decolorable colorants which are decolorized if heated. The sheet, on which the images are formed using such decolorable colorants, can be reused by decolorizing the images by heating the sheet using a decolorizing apparatus.

The decolorizing apparatus includes first and second heating units configured to come into contact with one surface and the other surface of a sheet and heat the respective surfaces, and first and second heat source units configured to heat the first and second heating units. Here, in the modes of the decolorizing apparatus, it is considered that a double-surface decolorizing mode and a single-surface decolorizing mode are set. Here, in a case of the double-surface decolorizing mode, it is considered that both the surfaces of a sheet are decolorized using the first and second heating units while simultaneously heating both the first and second heating units.

On the other hand, in a case of the single-surface decolorizing mode, it is considered that the decolorizing target surface of the sheet is decolorized while heating only a heating unit which corresponds to the decolorizing target surface of the sheet. If so, the heating unit which corresponds to the non-decolorizing target surface of the sheet is not heated in the case of the single-surface decolorizing mode, and thus it is possible to save electric power as much as that.

However, in the decolorizing apparatus, it is necessary to enable a stable decolorizing process to be performed in addition to saving of an electric power.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a whole configuration diagram illustrating a decolorizing apparatus.

FIG. 2 is a flowchart illustrating the concept of a decolorizing process performed by a controller.

FIG. 3 is a block diagram illustrating the hardware configuration of the decolorizing apparatus.

FIG. 4 is a view illustrating the configuration of a decolorizing unit.

FIG. 5 is a view illustrating the relationship between the temperature of a heat roller and the decolorizing degree of an image.

FIG. 6 is a view illustrating variation in the temperatures of first and second heating rollers when the second heating roller is not heated in a case of a single-surface decolorizing mode.

FIG. 7 is a view illustrating variation in the temperatures of the first and second heating rollers when a double-surface decolorizing process is performed after the single-surface decolorizing process is performed.

FIG. 8 is a flowchart illustrating a method of controlling first and second heat source lamps using a controller when a decolorizing operation starts.

FIG. 9 is a view illustrating conditions for the control of the first and second heat source lamps.

DETAILED DESCRIPTION

In general, according to one embodiment, a decolorizing apparatus includes first and second heating units, first and

2

second heat source units, and a controller. The first and second heating units decolorize an image using decolorable colorants which are decolorized if heated. The first heating unit heats one surface of a sheet. The second heating unit heats a remaining surface which is opposite to the surface of the sheet heated by the first heating unit. The first heat source unit heats the first heating unit. The second heat source unit heats the second heating unit. The controller includes a first mode and a second mode. In the first mode, the controller performs a decolorizing process on both the surfaces of the sheet by heating the first and second heating units using the first and second heat source units. In the second mode, the controller performs the decolorizing process on one surface of the sheet by heating the first heating unit using the first heat source unit, and heats the second heating unit using the second heat source unit with output which is lower than output acquired in the first mode.

Generally, in an embodiment, there is provided a method of controlling heat source units using a decolorizing apparatus which includes first and second heating units that are used to decolorize an image using decolorable colorants which are decolorized if heated, the first heating unit heating one surface of a sheet and the second heating unit heating a remaining surface which is opposite to the one surface of the sheet heated using the first heating unit, and first and second heat source units that heat the first and second heating units. The method of controlling heat source units includes: setting any one of a first mode and a second mode; in the first mode, performing a decolorizing process on both the surfaces of the sheet by heating the first and second heating units using the first and second heat source units; and, in the second mode, performing the decolorizing process on the one surface of the sheet by heating the first heating unit using the first heat source unit, and heating the second heating unit using the second heat source unit with output which is lower than output acquired in the first mode.

Hereinafter, embodiments will be described with reference to the accompanying drawings.

FIG. 1 is a whole configuration diagram illustrating a decolorizing apparatus 1.

The decolorizing apparatus 1 performs a decolorizing process of decolorizing the colors of images on a sheet on which the images are formed using a decolorable toner or decolorable colorants, such as decolorable ink. The decolorable colorants include color developing compound, a color developer, and a decolorizing agent. The color developing compound may include, for example, leuco dye which is colored in blue. The color developer may include, for example, phenol. The decolorizing agent may include a material which is compatible with the color developing compound when being heated and which does not include affinities with color developer. The decolorable colorants are colored through interaction between the color developing compound and the color developer, and decolorized in such a way that the mutual interaction between the color developing compound and the color developer is disconnected by heating the decolorable colorants at a temperature which is equal to or greater than a decolorizing temperature.

The decolorizing apparatus 1 includes a paper feeding tray 11, a paper feeding unit 12, first to third transport paths 131 to 133, a reading unit 14, a decolorizing unit 15, flappers 171 and 172, a transport roller 18, a reuse tray 19, a reject tray 20, a display unit 91, an operation input unit 92, and a controller 93 (FIG. 3).

The sheet on which the images are formed using decolorable colorants is placed on the paper feeding tray 11. When the images are formed using the decolorable colorants on

only one surface of the sheet, the paper feeding tray **11** contains the sheet while the surface (first surface) faces up.

The paper feeding unit **12** feeds the sheets placed on the paper feeding tray **11** to the first transport path **131** one by one.

The reading unit **14** is arranged along the first transport path **131**. The reading unit **14** includes a Charge Coupled Device (CCD) and reads the images on both the surfaces (the first surface and a second surface) of the sheet before decolorizing is performed.

The second transport path **132** branches from the first transport path **131** at the branching point **134** of the first transport path **131**, and is joined to the first transport path **131** at a joint point **135** which is upstream from the reading unit **14** in the sheet transport direction. The third transport path **133** branches from the branching point **134**. A first branch path **137** and a second branch path **138** branch from the branching point **136** of the third transport path **133**.

The decolorizing unit **15** is arranged along the second transport path **132**. The decolorizing unit **15** performs the decolorizing process on the images which are formed on either both the surfaces or the single surface of the sheet by heating either both the surfaces or the single surface of the sheet.

The display unit **91** is a touch panel on the like.

The operation input unit **92** includes buttons or keys, and receives operation input from a user.

Hereinafter, the concept of the decolorizing process performed by the controller **93** will be described with reference to FIG. **1** and a flowchart in FIG. **2** in brief.

The controller **93** includes a double-surface decolorizing mode (first mode) in which both the surfaces of a sheet are decolorized and a single-surface decolorizing mode (second mode) in which the single surface of the sheet is decolorized as decolorizing process modes.

The controller **93** receives input from the user using the operation input unit **92**, and sets the decolorizing process mode to any one of the double-surface decolorizing mode and the single-surface decolorizing mode (Act **10**). Meanwhile, the double-surface decolorizing mode may be set to default and the single-surface decolorizing mode may be set by the input from the user.

The controller **93** fetches a sheet on at least one surface thereof on which images are formed, from the paper feeding tray **11** using the paper feeding unit **12** (Act **11**), and feeds the sheet to the first transport path **131** (Act **12**).

The controller **93** reads the sheet using the reading unit **14**, and outputs read image data to an HDD **934** (FIG. **3**) (Act **13**). Therefore, the user can acquire the image data of the sheet from the HDD **934** before the decolorizing is performed.

The controller **93** transports the sheet through the second transport path **132** (Act **14**), and decolorizes the images on the sheet using the decolorizing unit **15** (Act **15**). At this time, the controller **93** changes control which is performed on the decolorizing unit **15** in accordance with setting of the decolorizing process mode, and the details thereof will be described later.

The controller **93** transports the sheet through the first transport path **131** (Act **16**), and reads the sheet again using the reading unit **14** (Act **17**).

The controller **93** transports the sheet from the first transport path **131** to the third transport path **133**, causes the sheet to wait in the first branch path **137** which precedes a branching point (Act **18**), and determines whether or not the sheet can be reused based on the image data of the sheet acquired after decolorizing is performed (Act **19**).

When it is determined that the sheet acquired after decolorizing is performed can be reused (Act **19**: YES), the controller **93** discharges the sheet from the first branch path **137** to the reuse tray **19** without change (Act **20**). When it is determined that the sheet cannot be reused because there is a defective image on the sheet (decoloring residue) or the like (Act **19**: NO), the controller **93** performs switchback transport of the sheet from the first branch path **137** to the second branch path **138** and then discharges the sheet from the second branch path **138** to the reject tray **20** (Act **21**).

FIG. **3** is a block diagram illustrating the hardware configuration of the decolorizing apparatus **1**.

The controller **93** includes a processor **931**, an Application Specific Integrated Circuit (ASIC) **932**, a memory (storage unit) **933**, a Hard Disk Drive (HDD, storage unit) **934** and a switching element **935**, and controls the whole decolorizing apparatus **1**.

The processor **931** implements various functions by executing programs which are stored in the memory **933** or the HDD **934**. The memory **933** is a semiconductor memory, and includes a Read Only Memory (ROM) which stores various control programs, and a Random Access Memory (RAM) which provides a temporal operating area to the processor **931**. The ROM stores various temperatures and conditions which are used for the control of first and second heat source lamps **25** and **26** of the decolorizing unit **15**. The ASIC **932** is a dedicated circuit for implementing a specific function, and may include an appropriate function implemented by the processor **931**.

The switching element **935** will be described later.

FIG. **4** is a view illustrating the configuration of the decolorizing unit **15**.

The decolorizing unit **15** includes first and second heating rollers **21** and **22**, first and second press rollers **23** and **24**, the first and second heat source lamps **25** and **26** (first and second heat source units), first and second thermal sensors **27** and **28**, and a transport motor **29**.

The first heating roller **21** is commonly used when the single-surface decolorizing process and the double-surface decolorizing process are performed. The first heating roller **21** decolorizes images on the first surface by heating the first surface of a sheet which comes on the upper side of paper feeding tray **11**.

The second heating roller **22** is used only when the double-surface decolorizing process is performed and is positioned downstream from the first heating roller **21**. The second heating roller **22** decolorizes images on the second surface by heating the second surface (surface which comes to the lower side of the paper feeding tray **11**) which is opposite to the first surface of the sheet heated by the first heating roller **21**.

The first and second press rollers **23** and **24** face the first and second heating rollers **21** and **22**, and come into pressure contact with the first and second heating rollers **21** and **22**.

The first and second heating rollers **21** and **22** heat the sheet while transporting the sheet interposed between the first and second heating rollers **21** and **22** and the first and second press rollers **23** and **24**, and decolorize the images formed on the sheet.

The first and second heat source lamps **25** and **26** are halogen lamps which are included in the respective first and second heating rollers **21** and **22**, and are configured to heat the first and second heating rollers **21** and **22**.

In the embodiment, the diameter of the first heating roller **21** is 20 mm, the diameter of the first press roller **23** is 40 mm, and the first heat source lamp **25** is provided with 700 W. The diameter of the second heating roller **22** is 20 mm, the diam-

5

eter of the second press roller **24** is 30 mm, and the second heat source lamp **26** is provided with 600 W.

The first and second thermal sensors **27** and **28** are contact type sensors using, for example, a thermistor, and detect the temperatures of the first and second heating rollers **21** and **22**.

The transport motor **29** drives the rotation of the first and second heating rollers **21** and **22** and the first and second press rollers **23** and **24**.

The above-described switching element **935** (FIG. 2) can supply electric power to the first heat source lamp **25** when being turned on, and is capable of supplying electric power to the second heat source lamp **26** when being turned off. The controller **93** is capable of controlling the outputs of the first and second heat source lamps **25** and **26** by performing Pulse Width Modulation (PWM) control in which the switching element is turned on or off. In addition, the controller **93** is capable of simultaneously lighting the first and second heat source lamps **25** and **26** without performing the PWM control.

When warming-up is performed, the controller **93** performs simultaneous lighting control on the first and second heat source lamps **25** and **26** in order to improve the operability of the decolorizing apparatus **1** by shortening warming-up time. When the decolorizing process or a wait operation is performed, electric power is used to drive the transport system motor, and thus the amount of electric power which can be used for the first and second heat source lamps **25** and **26** is limited. Therefore, when the decolorizing process or the wait operation is performed, the controller **93** performs the PWM control in which the first and second heat source lamps **25** and **26** are alternately lighted without simultaneously lighting the first and second heat source lamps **25** and **26**.

In addition, the controller **93** performs feedback control on the first and second heat source lamps **25** and **26** based on the outputs of the first and second thermal sensors **27** and **28** such that the temperatures of the first and second heating rollers **21** and **22** are close to target temperatures.

FIG. 5 is a view illustrating the relationship between the temperatures of the heating rollers and the decolorizing degree of images.

As shown in FIG. 5, if the temperatures of the heating rollers are not heated at a predetermined temperature or higher when the decolorizing process is performed, images are not completely decolorized and a defective image (decolorizing residue or uneven decolorizing) is generated. Hereinafter, a temperature in which a defective image is not generated is described as a defective image non-generation temperature. In the embodiment, the defective image non-generation temperature is 130° C.

FIG. 6 is a view illustrating change in temperatures of the first and second heating rollers **21** and **22** when the second heating roller **22** is not heated in the single-surface decolorizing mode.

A case is considered in which a target temperature of the first heating roller **21** is 160° C. and a target temperature of the second heating roller **22** is 155° C. in the double-surface decolorizing mode and in which the second heating roller **22** is not heated in the single-surface decolorizing mode. In this case, in the beginning of the single-surface decolorizing mode, the temperature of the second heating roller **22** is close to the target temperature 155° C. However, when the sheet passes through the second heating roller **22** and the heat of the second heating roller **22** is taken away, the temperature of the second heating roller **22** drops below 130° C. which is the defective image non-generation temperature.

Even when the single-surface decolorizing mode is switched into the double-surface decolorizing mode and the

6

second heating roller **22** is heated, the temperature of the second heating roller **22** does not reach the defective image non-generation temperature 130° C. for a while. Therefore, if the double-surface decolorizing operation of the decolorizing unit **15** starts when the single-surface decolorizing mode is switched into the double-surface decolorizing mode, the temperature of the second heating roller **22** drops below the defective image non-generation temperature 130° C., and a defective image is generated on the sheet.

FIG. 7 is a view illustrating variation in the temperatures of the first and second heating rollers **21** and **22** when the double-surface decolorizing process is performed after the single-surface decolorizing process is performed in the embodiment.

In the embodiment, in the single-surface decolorizing mode, the controller **93** performs the decolorizing process on one surface of the sheet by heating the first heating roller **21** using the first heat source lamp **25**, and heats the second heating roller **22** using the second heat source lamp **26** with output which is lower than the output acquired in the double-surface decolorizing mode.

More specifically, in the double-surface decolorizing mode, the controller **93** heats the first heating roller **21** by targeting a temperature 160° C. (first temperature) which is higher than the defective image non-generation temperature 130° C., and heats the second heating roller **22** by targeting a temperature 155° C. (second temperature) which is higher than the defective image non-generation temperature 130° C.

In addition, in the single-surface decolorizing mode, the controller **93** heats the first heating roller **21** by targeting a temperature 160° C. (third temperature) which is higher than the defective image non-generation temperature 130° C., and heats the second heating roller **22** by targeting a temperature 140° C. (fourth temperature) which is higher than the defective image non-generation temperature 130° C. and is lower than the second temperature 155° C. (second temperature) that is the target temperature in the double-surface decolorizing mode.

As described above, the controller **93** heats the second heating roller **22** at a temperature which is equal to or higher than the defective image non-generation temperature 130° C. in the single-surface decolorizing mode. In addition, in order to save electric power, the controller **93** heats the second heating roller **22** by targeting a temperature of 140° C., which is lower than the target temperature 155° C. in the double-surface decolorizing mode, in the single-surface decolorizing mode.

Therefore, in the embodiment, when the decolorizing unit starts the double-surface decolorizing operation, the temperature of the second heating roller **22** exceeds the defective image non-generation temperature 130° C., and thus it is possible to perform the stable decolorizing process by suppressing a defective image from being generated while electric power is saved.

Hereinafter, a method of controlling the first and second heat source lamps **25** and **26** using the controller **93** when the decolorizing operation starts will be described with reference to a flowchart in FIG. 8 and FIG. 9. FIG. 9 is a view illustrating conditions for the control of the first and second heat source lamps **25** and **26**.

In the case of the single-surface decolorizing mode when the decolorizing operation starts (Act 31: YES), the controller **93** sets the target temperature of the first heating roller **21** to 160° C. and sets the target temperature of the second heating roller **22** to 140° C. (Act 32). Further, the controller **93** performs the PWM control in which the first and second heat source lamps **25** and **26** are alternately lighted such that the

temperatures of the first and second heating rollers **21** and **22** are close to the respective target temperatures (reference temperatures) based on the temperatures of the first and second heating rollers **21** and **22** which are detected by the first and second thermal sensors **27** and **28**.

More specifically, when the temperature of the second heating roller **22** is equal to or higher than 145° C. (Act **33**: YES), the controller **93** outputs electric power only to the first heat source lamp **25** such that the temperature of the first heating roller **21** is close to the target temperature 160° C. (Act **34**).

When the temperature of the second heating roller **22** is equal to or higher than 130° C. and lower than 145° C. (Act **33**: NO and Act **35**: YES), the controller **93** performs the PWM control such that the temperature of the first heating roller **21** is close to the target temperature 160° C. and the temperature of the second heating roller **22** is close to the target temperature 140° C. At this time, the controller **93** sets a duty ratio, which indicates the ON or OFF time of the switching element **935**, to 85:15, sets the ON time that is output time to the first heat source lamp **25** in a single cycle to maximally 900 msec, and sets an OFF time that is output time to the second heat source lamp **26** in the single cycle to maximally 150 msec (Act **36**).

When, the temperature of the second heating roller **22** is lower than 130° C. (Act **35**: NO), the controller **93** performs the PWM control in such a way that the target temperatures of the respective first and second heating rollers **21** and **22** are 160° C. and 140° C., that is, the same as in Act **36** but the duty ratio is set to a value which is different from the value in Act **36**. That is, the controller **93** sets the duty ratio to 75:25, sets the maximum ON time in the single cycle for the first heat source lamp **25** to 900 msec, and sets the maximum OFF time in the single cycle for the second heat source lamp **26** to 300 msec (Act **37**).

If the decolorizing process performed on the sheet which corresponds to the target of the decolorizing process ends in the single-surface decolorizing mode, the controller **93** ends the processes in Act **33** to Act **37** (Act **38**: YES).

In the process, as shown in FIG. 7, although the temperature of the second heating roller **22** drops when the sheet passes through the second heating roller **22**, the controller **93** performs feedback control on the temperature of the second heating roller **22** using the target temperature 140° C., and thus it is possible to maintain the second heating roller **22** such that the temperature thereof is equal to or higher than the defective image non-generation temperature 130° C.

Therefore, in the embodiment, when the single-surface decolorizing mode is switched into the double-surface decolorizing mode, it is possible to set the temperature of the second heating roller **22** to a temperature which is equal to or higher than the defective image non-generation temperature 130° C. from the beginning, and thus it is possible to rapidly and excellently perform double-surface decolorizing process.

In the case of the double-surface decolorizing mode when the decolorizing operation starts (Act **31**: NO), the controller **93** sets the target temperature of the first heating roller **21** to 160° C., and sets the target temperature of the second heating roller **22** to 155° C. (Act **39**). Further, the controller **93** performs the PWM control on the first and second heat source lamps **25** and **26** such that the temperatures of the first and second heating rollers **21** and **22** are close to the respective target temperatures. At this time, the controller **93** sets the duty ratio to 75:25, sets the maximum ON time of the first heat source lamp **25** in a single cycle to 900 msec, and sets the maximum OFF time of the second heat source lamp **26** in a single cycle to 300 msec (Act **40**).

If the decolorizing process performed on the sheet which corresponds to the target of the decolorizing process ends in the double-surface decolorizing mode, the controller **93** ends the processes in Act **39** and Act **40** (Act **41**: YES).

Modification Example

The decolorizing apparatus **1** may not include the reading unit **14**. In this case, the decolorizing unit **15** may be positioned in the first transport path **131**.

The heating unit may not be a heating roller, and may be a surface-shaped heater which is capable of coming into contact with the surface of a sheet.

The order of each process in the embodiment may be different from the order exemplified in the embodiment.

As described above, according to the technology described in the specification, it is possible to provide a technology of controlling a heat source unit of a decolorizing apparatus.

While certain embodiments have been described, these embodiments have been presented by way of example only, and are not intended to limit the scope of invention. Indeed, the novel apparatus, methods and system described herein may be embodied in a variety of other forms; furthermore, various omissions, substitutions and changes in the form of the apparatus, methods and system described herein may be made without departing from the spirit of the inventions. The accompanying claims and their equivalents are intended to cover such forms or modifications as would fall within the scope and spirit of the inventions.

What is claimed is:

1. A decolorizing apparatus comprising:

first and second heating units that are used to decolorize an image using decolorable colorants which are decolorized if heated, the first heating unit heating one surface of a sheet and the second heating unit heating a remaining surface which is opposite to the one surface of the sheet heated using the first heating unit;

a first heat source unit that heats the first heating unit, and a second heat source unit that heats the second heating unit;

a switching element that supplies electric power to one of the first and second heat source units when being turned on, and supplies electric power to the other of the first and second heat source units when being turned off; and

a controller that includes a first mode and a second mode which are set when a first decolorizing process and a second decolorizing process are performed, performs the first decolorizing process on both the surfaces of the sheet by heating the first and second heating units using the first and second heat source units by targeting a first temperature of the second heat source unit in the first mode, and performs the second decolorizing process on one surface of the sheet by heating the first heating unit using the first heat source unit, and heats the second heating unit using the second heat source unit by targeting a second temperature of the second heat source unit which is lower than the first temperature in the second mode, the controller controls the outputs of the first and second heat source units using Pulse Width Modulation control in which the switching element is turned on or off in the first and second modes, the controller simultaneously supplies electric power to the first and second heat source units and controls the first and second heat source units when warming-up is performed.

2. The apparatus according to claim 1, wherein the controller, in the second mode, heats the second heating unit using the second heat source unit at a

9

temperature which is equal to or higher than a defective image non-generation temperature in which a defective image is not generated when the decolorizing process is performed on the remaining surface of the sheet using the second heating unit.

3. The apparatus according to claim 2, further comprising: first and second thermal sensors that detect temperatures of the first and second heating units,

wherein, based on outputs of the first and second thermal sensors, the controller

in the first mode, heats the first heating unit by targeting a third temperature which is higher than the defective image non-generation temperature, and heats the second heating unit by targeting a first temperature which is higher than the defective image non-generation temperature, and

in the second mode, heats the first heating unit by targeting a fourth temperature which is higher than the defective image non-generation temperature, and heats the second heating unit by targeting a second temperature which is higher than the defective image non-generation temperature and lower than the first temperature.

4. The apparatus according to claim 3, wherein the first temperature is lower than the third temperature and the second temperature is lower than the fourth temperature.

5. A method of controlling heat source units using a decolorizing apparatus which includes first and second heating units that are used to decolorize an image using decolorable colorants which are decolorized if heated, the first heating unit heating one surface of a sheet and the second heating unit heating a remaining surface which is opposite to the one surface of the sheet heated using the first heating unit, first and second heat source units that heat the first and second heating units, and a switching element that supplies electric power to one of the first and second heat source units when being turned on, and supplies electric power to the other of the first and second heat source units when being turned off, the method comprising:

setting a first mode or a second mode when a first decolorizing process or a second decolorizing process are performed:

in the first mode, performing the first decolorizing process on both surfaces of the sheet by heating the first and second heating units using the first and second heat source units by targeting a first temperature of the second heating unit;

10

in the second mode, performing the second decolorizing process on the remaining surface of the sheet by heating the first heating unit using the first heat source unit, and heating the second heating unit using the second heat source unit by targeting a second temperature of the second heating unit which is lower than the first temperature;

controlling the output of the first and second heat source units using Pulse Width Modulation control in which the switching element is turned on or off in the first and second modes; and

simultaneously supplying electric power to the first and second heat source units and controlling the first and second heat source units when warming-up is performed.

6. The method according to claim 5, further comprising: in the second mode, heating the second heating unit using the second heat source unit at a temperature which is equal to or higher than a defective image non-generation temperature in which a defective image is not generated when the decolorizing process is performed on the remaining surface of the sheet using the second heating unit.

7. The method according to claim 6, wherein the decolorizing apparatus further includes first and second thermal sensors that detect temperatures of the first and second heating units, and

wherein the method further comprises: based on outputs of the first and second thermal sensors, in the first mode, heating the first heating unit by targeting a third temperature which is higher than a defective image non-generation temperature, and heating the second heating unit by targeting a first temperature which is higher than the defective image non-generation temperature; and

in the second mode, heating the first heating unit by targeting a fourth temperature which is higher than the defective image non-generation temperature, and heating the second heating unit by targeting a second temperature which is higher than the defective image non-generation temperature and lower than the first temperature.

8. The method according to claim 7, wherein the first temperature is lower than the third temperature and the second temperature is lower than the fourth temperature.

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